1918-00028

Five-Year Review Report

For

Purity Oil Sales

Fresno County
California

September 28, 2001

PREPARED BY:

Region IX

United States Environmental Protection Agency

San Francisco, CA

Approved by: Date:

Keith Takata
Division Director
U.S. EPA Region IX

9-28-01

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List of Acronyms

1,2-DCA	1,2- Dichloroethane
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ATSF	Atchison Topeka and Santa Fe Railway
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, compensation, and Liability Act
CFR	Code of Federal Regulations
DHS	Department of Health Services
DNAPL	Dense Non-Aqueous Phase Liquid
DWR	Drinking Water Requirements
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FID	Fresno Irrigation District
GWPS	Ground Water Protection System
HDPE	High Density Polyethylene
IRM	Interim Remedial Measure
MCLs	Maximum Contaminant Levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
OU	Operable Unit
OU1	Operable Unit 1 - Ground Water and Tanks
OU2	Operable Unit 2 - Soils
PAH	Polyaromatic Hydrocarbons
PCB	Poly Chlorinated Biphenyls
PRP	Potentially Responsible Party
QAM	Quality Assurance Management
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROD1	1989 Record of Decision for Ground Water and Tanks Operable Unit
ROD2	1992 Record of Decision for Soils Operable Unit
RWQCB	Regional Water Quality control Board
SARA	Superfund Amendments and Reauthorization Act
TBC	To Be Considered
UAO	Unilateral Administrative Order
VOC	Volatile Organic Compound
WQCAL	Water Quality Criteria Action Level

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Purity Oil Sales		
EPA ID *(from WasteLAN)*: CAD980736151		
Region: IX	**State:** CA	**City/County:** Malaga/ Fresno County

SITE STATUS	
NPL status: ✖ Final ☐ Deleted ☐ Other (specify)	
Remediation status (choose all that apply): ✖ Under Construction ☐ Operating ☐ Complete	
Multiple OUs? ✖ YES ☐ NO	**Construction completion date:** N/A
Has site been put into reuse? ☐ YES ✖ NO	

REVIEW STATUS	
Reviewing agency: ✖ EPA ☐ State ☐ Tribe ☐ Other Federal Agency	
Author name: Rick Sugarek	
Author title: Remedial Project Manager	**Author affiliation:** EPA Region IX
Review period: August 2001 to September 2001	
Date(s) of site inspection: 9/24/2001	
Type of review: ✖ Statutory ☐ Policy (✖Post-SARA ☐ Pre-Sara ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion)	
Review number: ✖ 1(first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify)	
Triggering action: ✖ Actual RA Onsite Construction at OU # 1 ☐ Actual RA Start at OU# ___ ☐ Construction Completion ☐ Previous Five-Year Review Report ☐ Other (specify)	
Triggering action date *(from WasteLAN)*: 1/10/1994	
Due date *(five years after triggering action date)*: 1/10/1999	

Five-Year Review Summary Form

Deficiencies:

The remedy selected in EPA's 1989 Record of Decision (ROD1) to address contaminated ground water at the Purity Oil Sales site has not established hydraulic containment of the contaminated plume and has not met EPA's water quality cleanup goals.

Recommendations and Follow-up Actions:

It is important that the long-term aspects of ground water cleanup issues and goals be addressed through further study and additional remedial action to assure attainment of EPA's water quality cleanup goals for the Site.

Further information will be obtained regarding the ROD1 remedy by :

a. revising sampling protocols to include appropriate additional data parameters and to ensure that the data meets appropriate data quality objectives;
b. acquiring additional ground water monitoring data from existing wells;
c. installing and monitoring additional ground water wells as necessary;
d. conducting testing to determine the feasibility of addressing the sources of volatile organic compounds in ground water with nutrient enhanced bioremediation; and
e. conducting testing to determine the feasibility of addressing chlorinated solvents in ground water by the addition of hydrogen-releasing or oxygen-releasing compounds to the subsurface.

Protectiveness Statement(s):

Immediate threats have been addressed through the provision of alternate water supply, removal of seven storage tanks, enclosure of the North Central Canal in a pipeline, and relocation of nearby residents. The treatment plant for OU1 is effective in meeting regulatory requirements for the water treated at the facility. The OU2 remedy currently being constructed is expected to be protective upon completion with respect to eliminating threats posed by direct contact with the wastes.

The remedy for OU1, the Groundwater and Tanks Operable Unit, is protective over the near-term, however, the long-term protectiveness determination for OU1 cannot be made at this time until further information is obtained.

It is expected that these actions will take approximately two and one-half years to complete, at which time a protectiveness determination will be made.

I. Introduction

The purpose of the five-year review for the remedial actions implemented at the Purity Oil Sales Superfund site is to evaluate the implementation and performance of the remedy to determine whether the remedy is or will be protective of human health and the environment. The methods, findings and conclusions of the review are documented in this five-year review report. In addition, the five-year review report identifies deficiencies found during the review and identifies recommendations to address them.

The United States Environmental Protection Agency (EPA) prepared this five-year review for the Purity Oil Sales site in Fresno County, California pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121:

> *If the President selects a remedial action that results in any hazardous substances, pollutants or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with Section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40CFR §300.430(f)(4)(ii):

> *If a remedial action is selected that results in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

This five-year review was conducted from August 2001 through September 2001. This report documents the results of the review. Tetra Tech EMI provided technical support to EPA for the five-year review by conducting the site inspection and evaluating treatment plant and groundwater collection performance data. This five-year review is required by Statute. EPA must implement five-year reviews at sites where upon completion of the remedial action, hazardous substances, pollutants or contaminants will remain on site, and where the Record of Decision was signed on or after October 17, 1986 (the effective date of SARA, and the remedial action was selected under CERCLA §121. This is the first five-year review for the Purity Oil Sales Superfund site. The triggering action for this review is the initiation of actual on site construction on January 10, 1994. Additional five-year reviews will be required until the site allows for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1 lists the chronology of events for the Purity Oil Sales site.

Table 1: Chronology of Site Events

Date	Event
1980-1981	*RWQCB conducts surface water and ground water sampling*
February 1982	*EPA, DHS, RWQCB perform site investigation*
September 1983	*National Priorities List (NPL) listing*
January 1986	*EPA becomes the lead agency*
May 1986	*DHS issues a Remedial Investigation Report*
May 1986	*EPA implements emergency response "tarry" soil removal*
September 1987	*EPA implements emergency response oil and water removal*
October 1988	*EPA issues supplemental Remedial Investigation report*
April 1989	*EPA issues Feasibility Study and Proposed Plan for soils and ground water*
September 1989	*EPA issues ROD for Ground Water and Tanks OU*
October 1990	*Remedial Action to remove seven tanks implemented*
September 1991	*UAO issued to PRPs to design and construct ground water remedial action*
March 1992	*Alternate drinking water supply provided to down gradient private well users*
June 1992	*Revised Proposed Plan for Soils OU issued*
September 1992	*EPA issues ROD for Soils OU*
January 1994	*Begin On-site Construction of OU1 Ground Water Remedy*
December 1994	*Treatment plant commissioned and begins operation*
July 1996	*EPA issues an Explanation of Significant Differences for the Soils OU remedy to revise design requirements*
December 1998	*Consent Decree entered*
February 2000	*Construction on the Soils OU remedy begins*
March 2001	*EPA issues a second Explanation of Significant Differences to temporarily relocate residents during construction of the Soils OU remedy*

III. Background

The Purity Oil Sales Superfund site is located on a seven acre parcel at 3281 Maple Avenue (at Golden State Blvd.), approximately one-half mile south of the Fresno city limits in an unincorporated area of the Malaga township (Figure 1). An oil recycling facility was operated on the property between 1934 and 1975. The waste oils came from businesses such as service stations, car dealers, truck stops, electrical transformer yards, municipalities, school districts and the military.

Purity Oil Sales was included on the National Priority List in September 1983 based upon soils, ground water and air quality investigations conducted by the EPA, Department of Health Services (DHS), and the Regional Water Quality Control Board - Central Valley Region (RWQCB). EPA has addressed remediation of the Site with the designation of two Operable Units: OU1 Ground Water and Tanks; OU2 Soils Remediation.

Physical Characteristics

The Purity Oil Sales site is located on a seven acre parcel. The site is located within the San Joaquin River basin. The natural ground slope in the area is very gentle, i.e., approximately 0.1 percent (5 feet per mile) to the west southwest.

The basement rock at the site is greater than 1,000 feet below ground surface (bgs) and does not influence ground water flows under the site. The unconsolidated deposits, which overlay the basement rock, are flood plain deposits that consist of thick alluvial fans formed by the San Joaquin and King Rivers. The soils at the site are comprised of sands and silty sands, interspersed with layers of lower-permeability silt.

Land and Resource Use

Under the Fresno County General Plan, the Purity Oil Sales site is located in a zone that is designated for heavy industrial use (Figure 2). Most of the land in the vicinity of the Purity Oil Sales site is used for industrial or agricultural purposes.

Historically, some residences were located immediately north and south of the eastern portion of the property. A single family residence with a horse enclosure and a mobile home park (Tall Trees Trailer Park) were located immediately bordering the property. The single family residence and horse enclosure have been removed. The residents of the Tall Trees Trailer Park have recently been relocated in conjunction with the soils operable unit remedial action.

The industrial activity in the area includes businesses such as agricultural support industries, heavy equipment rentals, repair shops, retail shops, a former cotton oil manufacturing facility (Producer's Cotton Oil), scrap yards, several trucking yards and other miscellaneous "light" industries. Immediately bordering the Purity Oil Sales site are two junk yards; the

Atchison, Topeka and Santa Fe Railway Company (ATSF) right-of-way; the Golden State Market (a former service station, now used solely as a convenience store); and a propane distributor.

The area is traversed by the North Central and Central Canals which are operated and maintained by the Fresno Irrigation district (FID). The North Central Canal flows westward along the southern edge of the Purity Oil Sales property and cuts across its southwestern corner. As part of EPA's remedy, the portion of the North Central Canal on site has been placed in a concrete pipe.

About one-half mile to the west and southwest of the site are fields of oats, cotton, fruit trees, and grapes. During the summer, these fields are irrigated with water from the North Central Canal.

Historic Site Conditions

The easternmost portion of the site included the storage and processing facilities for the waste oil re-refining and recycling operations. The western portion of the site consisted of unlined sumps and sludge pits. The oil and by-products from the refining process were collected and stored in the sumps and storage tanks and were disposed of on-site in approximately seven large sludge pits.

In 1975 the waste pits were filled with construction debris under a RWQCB cleanup and abatement order. The western portion of the property is mounded several feet above the adjacent property as a result of backfilling and covering of the waste ponds in this area.

A fire at the site in 1976 destroyed the main warehouse building and adjacent equipment. Subsequent to the fire additional equipment was removed from the site and the area was partially regraded. Seven large steel tanks were all that remained of the processing equipment until the tanks were removed by EPA in October 1990.

Current Site Conditions

Currently, no aboveground structures related to the used oil recycling processing facilities remain at the Purity Oil Sales site. The Fresno Irrigation District North Central Canal has been enclosed in a reinforced concrete pipe placed immediately to the south of the original canal alignment along the southern property boundary and cutting across the southwest corner. The entire site is surrounded by a chain-link fence.

The north eastern portion of the 7 acre parcel is the location of the groundwater treatment plant constructed pursuant to the Record of Decision for OU1. The major components of the treatment system include two extraction wells, a buried double-containment conveyance pipeline, an influent storage tank, an air stripping tower, a potassium permanganate chemical feed system,

three greensand filtration tanks and backwash system, an intermediate surge storage tank, an effluent storage tank, and a buried discharge pipeline. Current facilities at the site also include the control room trailer associated with the treatment plant operations.

The remedial action to cap the western portion of the 7 acre parcel is currently underway. In general, the existing grade of the western portion of the site prior to remediation was raised 3 to 5 feet from the original ground surface when the waste pits were filled with rubble and construction debris in 1975. The selected remedial action will place a multi-layer RCRA compliant cap over the in place contaminated soils. Generally the cap consists of two feet of vegetated soil cover, a geotextile, a geonet, an HDPE membrane, a geosynthetic clay liner, and a foundation and gas collection layer. Currently, heavy construction equipment, associated construction offices and personnel necessary to implement the remedy are on site.

During the design for the cap and in the initial stages of the remedial action, contamination that originated from the Purity Oil Sales site was discovered in locations off property. The full extent of the potentially contaminated off site soils is not currently known and requires further study. It is known that contaminants are present in soils at the property boundary in several locations, at the Golden State Market, the Tall Trees Trailer Park and at the Pick-A-Part Auto Salvage Yard.

History of Contamination

The Purity Oil Sales oil recycling facility was operated on the property between 1934 and 1975. The waste oils came from businesses such as service stations, car dealers, truck stops, electrical transformer yards, municipalities, school districts and the military.

Historically, the easternmost portion of the site included the storage and processing facilities for the re-refining and recycling operations. The oil was re-refined using a number of treatment processes including clarification, chemical addition, acidification, dehydration, distillation, and filtration. The western portion of the site consisted of unlined sumps and sludge pits. The oil and by-products from the refining process were collected and stored in sumps and storage tanks and were disposed of on-site in approximately seven large sludge pits.

Initial Response

In 1973, Purity Oil Sales was ordered by a Superior Court to empty and backfill the waste pits. Owners of the site were issued a cleanup and abatement order in 1975 under the enforcement authority of the California Regional Water Quality Control Board. The waste pits were completely filled with construction debris. No evidence is available to indicate that the petroleum wastes stored in the pits were ever emptied.

A fire at the site in 1976 destroyed the main warehouse building and adjacent equipment. Subsequent to the fire, additional equipment was removed from the site, and the area was partially regraded.

EPA conducted a removal action in 1985 to remove 1,800 cubic yards of hazardous oily/tarry materials from the property. In 1987 EPA's emergency response team removed approximately 33,000 gallons of oil and water from one of the seven above ground tanks to eliminate the potential for a spill. Seven large steel tanks, all that remained of the waste oil processing equipment, were removed by EPA in October 1990.

Contamination

Groundwater at the site is contaminated with volatile organic compounds (VOCs), semi-volatile organic compounds, iron and manganese that discharged from the sumps and unlined pits. Soils at the site contains high levels of lead, polyaromatic hydrocarbons (PAHs); and several organic compounds. The buried waste contains benzene, toluene, PAHs, methylene chloride, phthalates, acetone, other solvents, lead and various metals. Soil contamination extends from the surface to ground water.

Acute toxic effects of 1,2-Dichloroethane (1,2-DCA), the primary groundwater contaminant, include central nervous system depression, lung irritation and injury to liver, kidney and adrenals. Chronic exposure can cause liver degeneration and kidney damage in laboratory animals. Repeated exposures have been associated with anorexia, nausea, liver and kidney dysfunction and neurological disorders in workers. 1,2-DCA is carcinogenic in mice and rats exposed orally. It is mutagenic in some tests in bacteria, barley and fruit flies.

Acute toxic effects of lead, the primary soil contaminant, include encephalopathy, abdominal pain, hemolysis, liver damage, rehnaltubular necrosis, seizures coma and respiratory arrest. Chronic exposure can affect the hematopoietic system, the nervous system and the cardiovascular system. Children appear to be especially sensitive to lead-induced nervous system injury.

The primary exposure pathways of concern for the site contaminants are:

- Contaminated groundwater use by downgradient residents or workers;
- Direct contact with contaminated site soils by trespassers and future onsite workers or residents;
- Direct contact with contaminated canal water and sediments by trespasser, farm workers and irrigation district workers; and
- Inhalation of site dusts by near site residents or workers, and future onsite residents or workers.

IV. Remedial Actions

A. Remedy Selection

ROD1: Ground Water and Tanks Operable Unit

ROD1 for the Ground Water and Tanks Operable Unit (OU1) for the Purity Oil Sales site was signed on September 26, 1989. The primary human health threats posed by contaminants addressed in OU1 were: (1) use of contaminated ground water by down gradient residents; and (2) direct contact with contaminated tarry sludges and soils present in the rusting processing tanks. The primary ground water contaminants of concern are volatile organic compounds, iron and manganese.

Ground Water and Tanks OU Remedial Action Objectives

Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAOs for OU1 are:

- Restore the sole source drinking water aquifer as soon as possible to meet federal and state drinking water standards;
- Provide safe drinking water to downgradient residents; and
- Eliminate the direct exposure threat posed by the hazardous wastes present in the seven steel tanks on the site.

Components of the Remedial Action for the Ground Water and Tanks Operable Unit

The major components for remediation of the threats posed by the contaminated ground water and wastes in the onsite tanks selected in ROD1 for the Purity Oil Sales site include the following:

- Remove and properly dispose the seven tanks remaining on site and their contents;

- Provide an alternate water supply to affected private well owners located northwest of the site; and

- Perform water treatment to remove volatile organic compounds (VOCs), iron and manganese from the ground water, including:
  - extraction of contaminated ground water to attain federal and state drinking water standards in the aquifer;
  - treatment of extracted contaminated ground water using greensand and air stripping to attain federal and state drinking water standards;

- disposal of treated and tested water by disposal in the North Central Canal;
- ground water monitoring to verify contaminant cleanup; and
- create a ground water management zone extending 1-2 miles from the cleanup target area to control pumping to maintain ground water levels at the desired configuration.

ROD2: Contaminated Soils Operable Unit

ROD2 for the Contaminated Soils Operable Unit (OU2) for the Purity Oil Sales site was signed on September 30, 1992. The primary human health threats posed by contaminants addressed in OU2 were: (1) direct contact with contaminated site soils and wastes in the backyard pits; (2) direct contact with contaminated canal water and sediments; and (3) inhalation of site dust. The primary surface soil contaminant of concern is lead. The primary contaminants of concern with respect to the wastes in the backyard pits and vadose zone include numerous organic compounds.

Contaminated Soils OU Remedial Action Objectives

Remedial Action Objectives (RAOs) were developed as a result of data collected during the Remedial Investigation to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAOs for OU2 are:

- Prevent further contamination of the ground water by containing the contaminated soils and wastes, and capturing and treating contaminants that discharge from the wastes;
- Prevent direct contact with contaminated surface soils and wastes on the property; and
- Prevent direct contact with sediments in the North Central Canal.

Components of the Remedial Action for the Contaminated Soils Operable Unit

The major components for remediation of the threats posed by the contaminated soils selected in ROD2 for the Purity Oil Sales site include the following:

- Treatment through soil vapor extraction of soils from 14 feet below the surface to the water table;
- Capping the site in accordance with the Resource Conservation and Recovery Act (RCRA) Subtitle C requirements;
- Installing a slurry wall around the perimeter of the site;
- Conducting environmental monitoring to ensure the effectiveness of the remedial action; and
- Enclosing the existing portions of the North Central Canal that abut the site within a reinforced concrete pipe.

Following signature of ROD2, two Explanations of Significant Differences (ESDs) were issued that detail differences in how the selected remedial action will be implemented.

The First ESD, issued by EPA in July 1996, detailed several technical changes to the design of the soil vapor extraction and containment systems. EPA eliminated the requirement for a retaining wall with the change to a sloping cover design. The cut-off wall was eliminated because no perched zones were found during pre-design efforts. EPA also approved a two-year post-construction monitoring period to evaluate the need for the soil vapor extraction system. The ESD also extended the boundaries of the site to include the rear of the Golden State Market because of the discovery of soils contaminated by Purity Oil Sales wastes.

The second ESD, issued by EPA in March 2001, provided for relocating the residents of the Tall Trees Trailer Park. EPA determined that it was necessary to temporarily relocate all residents during construction due to potential adverse exposures to contaminated soils and VOCs, and that 17 families closest to the property line needed to be permanently relocated.

B. Remedy Implementation

Ground Water and Tanks Operable Unit

EPA conducted two remedial actions in accordance with ROD1 for the Ground Water and Tanks OU. In October 1990, seven large tanks and their contents were removed from the site. In March 1992, private well users down gradient from the site were connected to either the Malaga County Water District or the city of Fresno water system.

On September 30, 1991, EPA issued Unilateral Administrative Order 91-28 requiring nine PRPs to design and construct the ground water extraction, treatment and disposal system. The PRPs agreed to perform the design and construct the groundwater remedial action for the Purity Oil Sales site. The PRPs formed a technical steering committee and conducted extensive pre-design studies to further characterize the geology and ground water contamination at the site. The final design was completed on June 22, 1993.

The remedial action to construct the extraction wells and treatment plant commenced in January 1994 with the award of all contracts for the construction. Construction was substantially completed in August 1994. Start-up/Shake-down operations continued through December 1994. The plant began routine treatment of ground water on December 28, 1994.

Contaminated Soils Operable Unit

An Administrative Order on Consent was issued in January 1994 requiring PRPs to design the remedial action for the Contaminated Soils Operable Unit (OU2). Based upon information gathered during Pre-design studies, EPA modified the requirements of the Record of Decision for OU2 in an Explanation of Significant Differences (ESD) in July 1996. EPA approved the final design for OU2 in September 1996.

The Fresno Irrigation District (FID) designed the portion of the remedy to enclose the existing portions of the North Central Canal that abut the site. In accordance with the approved design, the original canal is now enclosed within a reinforced concrete pipeline in this area. The FID completed construction of the pipeline in March 1998.

A Consent Decree and a Statement of Work requiring the implementation of the approved remedial design for OU2 was lodged in Federal Court in April 1998. In an ESD issued in March 2001, EPA provided for temporary relocation of nearby residents during construction of the OU2 remedy. The remedial action to construct the OU2 remedy is currently underway.

C. System Operations

Treatment Plant

Routine operation and maintenance (O&M) of the OU1 remedy began in January 1995. The O&M work plan included the performance of all necessary inspections, operational tasks, maintenance, repair, monitoring and reporting necessary to assure the proper treatment and discharge of the extracted ground water from the two constructed extraction wells.

Krazan Associate was the initial contractor hired to perform the O&M tasks. They performed O&M from January 1995 through April 1997. Morrison- Knudsen Corporation performed O&M from May 1997 until September 1997. Krazen Associate performed O&M from October 1997 through July 1998. IT Corporation (initially via the former Fluor Daniels GTI) has performed O&M from August 1998 to the present.

A review of the plant effluent water quality data indicates that the treatment system has performed as designed and is able to meet the required effluent quality performance standards. The plant equipment has required routine levels of maintenance and repairs, and has not required any unusual levels of maintenance or repair.

At some time during the period that Krazen was operating the treatment plant, the flow totalizer instrument failed due to low influent flow rates, and Krazen did not replace or repair the instrument. The flow data reported to the RWQCB from that time forward was a calculated value that is believed to be accurate. However, this methodology was never approved by the

RWQCB and is a violation of the NPDES permit. Upon the discovery of this problem in February 2001, IT Corporation notified the RWQCB and replaced the inoperative flow totalizer with an instrument located on the effluent line.

Ground Water Extraction Wells

Two ground water extraction wells were installed. Mechanically, the ground water extraction wells have performed as designed, and have required normal maintenance and repair since they became operational in December 1994. The extraction system has not, however, established hydraulic containment of the contaminant plume and thus does not meet the requirements of EPA's Record of Decision (ROD1). Based on the potentiometric data, the plume and the gradient across the site are unaffected by the extraction wells.

The original design called for implementation of up to five extraction wells in a phased approach as required to achieve significant deflection and capture of the contaminated plume. The extraction wells are located in a complex geologic setting of sand and silty sand layers that limits the production of these wells. The capture effectiveness of the extraction system is being further diminished by the ongoing depletion of the water table and fouling of the well sand packs. Current rates of extraction are well below the expected design flow rates, and the treatment plant has been operated as a batch treatment plant, operated twice per week, due to the extremely low inflows to the plant. The current effectiveness of the ground water remedy is restricted to stabilizing the chemical concentrations in the plume rather than treating it to meet water quality standards.

EPA has not implemented the ground water management zone component of ROD1 to control the influence of the remedy on the ground water levels in the regional aquifer, or to coordinate the implementation of the remedy with other uses of the aquifer. Information gathered during pre-design engineering studies, and in subsequent quarterly ground water monitoring efforts, indicates that the contaminated plume is stable and is not currently influenced by regional ground water users. EPA's remedy has had limited effect on the ground water in the vicinity of the site and has not impacted the regional ground water regime. As additional remedial measures are implemented, EPA will continue to monitor and assess the need for implementation of the ground water monitoring zone.

Available monitoring data indicate that a DNAPL may exist below the water table. If this DNAPL is present as a continuing source of contamination, the pump and treat system could, at best be expected to only prevent migration of the contaminants.

V. Progress Since the Last Five Year Review

This was the first five-year review for the site.

VI. Five Year Review Process

The Purity Oil Sales five-year review was led by Rick Sugarek, Remedial Project Manager for the site. The following team members assisted in the review:

- Rose Marie Caraway, EPA
- Angeles Herrera, EPA Community Involvement

This five-year review consisted of a review of relevant documents (see Attachment 1), and a site inspection (see the site inspection checklist, Attachment 2). The document review included the review of O&M records, monthly progress reports, effluent water quality data and monitoring data. A technical memorandum documents the evaluation of the plant performance and the review of operational data (see Attachment 3).

The completed Five-year Review report will be available in the information repository. Notice of its completion will be placed in the local newspaper.

VII. Five-Year Review Findings

A. Site Inspection

The site inspection was conducted for EPA on September 24, 2001 by Dr. Swanson of Tetra Tech EMI. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the performance and condition of the extraction wells and treatment plant equipment, and the condition and availability of plant operating and maintenance records. The OU2 remedy was not a focus of this inspection because it is currently under construction.

No significant maintenance issues were identified with either the wells or the treatment plant. Both of the extraction wells and the treatment plant equipment were in good working condition. There are several minor maintenance issues that will need to be addressed in the future at the wells and plant. The productivity of the extraction wells has declined over the period of operation, apparently due to plugging of the sand packs by metal precipitates. It may be necessary to treat this condition or replace the wells as appropriate. The treatment plant is currently operated as a batch treatment plant. Several mechanical systems at the plant are currently adequate to perform effective water treatment under the current batch operational scheme, but would require repair or replacement if the plant were to operate continuously at the design flow rate of 250 g.p.m.

The failure of the ground water extraction system to meet original design inflow requirements for the treatment plant is a significant concern with respect to the remedial objective of establishing hydraulic containment of the contaminant plume.

B. Data Review

Based on the data provided in the quarterly groundwater reports, hydraulic containment of the groundwater plume identified in the ROD (EPA 1989) and design (Environmental Solutions 1993) has not been reached. Also, ROD remediation goals for groundwater quality have not been achieved. Based on the potentiometric data and trends in the geochemical data, the water quality and groundwater gradient across the site are unaffected by the extraction wells. In fact, some of the most recent sampling results from and near the extraction wells indicate that contaminant concentrations are increasing with time.

The extraction wells only extend to 75 feet bgs, and do not capture any contamination from the deeper intermediate zone. The remedy's effectiveness is also being diminished by the depletion of the water table that has occurred since the design of the system. The current water table is at approximately 60 to 65 feet bgs, which reflects a drop of about 20 feet from the original site conditions at the time of the OU1 remedial design.

If a DNAPL plume exists below the water table, a pump-and-treat groundwater treatment system can at best only prevent the migration of the plume if hydraulic containment is attained. Achieving the water quality goals for the chlorinated VOCs does not appear likely with the current groundwater treatment system, even with the construction of the proposed OU 2 closure-cover and SVE systems.

Groundwater monitoring results indicate possible migration of DNAPL as a separate phase downward through the vadose zone into the shallow and intermediate aquifers. In addition to the concern regarding DNAPL in the vadose zone, light nonaqueous phase liquid (LNAPL) in contact with the saturated zone could be a continuing source of groundwater contamination.

As presented in the remedial investigation (RI) report, significant LNAPL and DNAPL exist in the vadose zone and continue to be a source of contamination to soil gas and groundwater. The groundwater data show that both light and dense organic compounds, such as benzene, trichloroethene (TCE), and dichloroethene (DCE), are present in the upper, shallow aquifer. The dense compounds, such as TCE and DCE, have also been consistently detected in the intermediate aquifer in a dissolved phase, located at a depth range of 72 to 105 feet below ground surface (bgs). Whether these chemicals emanate from a LNAPL at the water table or a DNAPL now in the saturated zone, they provide an ongoing source of contamination that would be unaffected by the construction of RCRA cap. While the presence of a DNAPL is not confirmed, it is to be noted that solvents, coal tars, and creosotes can act as DNAPL and that the sulfonated oily wastes apparently have higher densities than the oils separated for recycling and resale.

The quarterly groundwater monitoring data indicate that benzene, toluene, ethylbenzene, and xylene compounds are not diminishing, implying that there is a source of these chemicals

partitioning to the groundwater. The source may be by-products from masses of LNAPL in either the vadose or saturated zones. Since the goal of the ROD is to meet water quality standards (EPA 1989), the location and continued degradation of these sources should be considered. Geochemical processes that degrade and move contaminants in groundwater are time dependent and are limited by mass transfer processes. The current OU 1 and OU 2 designs may not provide for the long-term degradation and removal of LNAPL sources at the site. The quarterly groundwater monitoring data also indicate that some degree of biodegradation of the chlorinated compounds is occurring, however, the data suggest that under the current remediation scheme, the ROD remediation goals will not be met within any reasonable time frame.

It is important that the long-term aspects of ground water cleanup issues and goals be addressed through further study and additional remedial action to assure attainment of EPA's water quality cleanup goals for the Site.

VIII. Assessment

The following conclusions support a determination that several initial measures implemented as components of the remedy for OU1, the Ground Water and Tanks OU, at the Purity Oil Sales site are protective in the near-term, but that the long-term protectiveness determination for the remedy for OU1 should be deferred until additional data acquisition, pilot studies and remediation, if required, can be performed.

Question A: Is the remedy functioning as intended by the decision documents?

Several components of the remedy selected in ROD1 and ROD2 for the Purity Oil Sales site are functioning effectively as intended. However, the extraction system for the ground water pump and treat remedy selected in ROD1 has failed to establish hydraulic containment of the contaminant plume, a primary objective of the remedy and its design.

ROD1: Ground Water and Tanks Operable Unit

The alternate source for drinking water provided by ROD1 to downgradient residents that historically relied on private wells for their drinking water supply has effectively removed the threats posed by the contaminated sole source aquifer. The ROD1 tank removal has effectively removed the threat of direct exposure to the contaminants in the tanks. The ROD1 waste water treatment plant is able to effectively remove contaminants from the extracted ground water that is conveyed to the plant for treatment and meet ROD1 regulatory requirements.

Although the treatment plant is able to effectively remove contaminants from the water, the extraction system currently does not meet the design criteria with respect to the amounts of water extracted from the aquifer for treatment. Currently only a small fraction of the design flow rate is delivered to the treatment plant for treatment. This is in part due to the location of the

wells, the screen interval and the complex geology in the area which in combination limit the overall effectiveness of the extraction approach. An additional factor that makes it more difficult to extract sufficient quantities of water from the contaminated aquifer is that the regional water table has significantly declined, approximately 20 feet, over the past seven years.

As the direct result of these several factors not meeting the original design parameters, the remedy is currently not able to establish hydraulic control of the contaminated ground water plume. Hydraulic control of the contaminated plume, combined with treatment, was the primary means of reestablishing protective water quality in the aquifer, a designated sole source aquifer.

ROD2: Contaminated Soils Operable Unit

The ROD2 enclosure of the FID's North Central Canal within a reinforced concrete pipeline has effectively addressed the exposure pathway for site contaminants that may impact this irrigation water supply canal.

The RCRA compliant cap for the contained contaminated soils of the ROD 2 remedy is currently under construction. During construction of the perimeter anchor trenching, additional contaminated soils were discovered off-property. In order to address the threats to human health and the environment, these additional wastes must be addressed either in the ongoing remedial action, or in a follow up action.

Question B: Are the assumptions used at the time of remedy selection still valid?

In general, many of the assumptions used at the time of the remedy selection in ROD1 and ROD2 are still valid. The OU1 alternate water supply and tank removal components, as well as the OU2 FID pipeline component rely on remedial assumptions that remain valid. There have been no changes in physical conditions of the site that would affect the protectiveness of the remedy. There have been no changes in ARARs for the remedy.

The data provided in the quarterly ground water monitoring reports indicate that the technical assumptions that underlie the ROD1 pump and treat remedy for the restoration of the contaminated aquifer may not be valid. The extraction wells have not been able to establish hydraulic control of the contaminated plume, nor have the water quality goals been achieved. Additional data are required to evaluate whether EPA's ground water remedy could be successful with the installation of additional extraction wells, or whether alternate remedial approaches, such as in situ bioremediation, may prove to be more effective. Additional data is required to evaluate these issues.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the ROD1 or ROD2 remedies.

Data are available that indicate that implementation of the ROD1 pump and treat ground water remedy has not been effective to date. Interpretation of the available data indicates that it is appropriate to acquire additional data to properly establish and monitor the geochemical properties and distribution of the contaminated plume.

The additional data, along with re-interpretation of the initial design assumptions and performance of the ROD1 remedy, will allow EPA to make a determination of whether implementation of additional extraction wells could establish hydraulic control of the contaminated plume, and meet EPA's cleanup objectives.

Based upon the lack of success to date of the pump and treat remedy in this geologic setting, it is also appropriate to pilot test additional remedial approaches, such as in situ bioremediation approaches, for potential consideration. Available ground water data, if confirmed by the additional data to be acquired, may support the interpretation that natural attenuation of the contaminated ground water plume is occurring and could be enhanced.

If natural attenuation is indeed occurring, it would be less important to establish hydraulic control of the plume. Remediation of the contaminated aquifer to protect human health and the environment could be addressed by other means, such as enhanced natural attenuation or in situ bioremediation.

IX. Issues

Data from the existing wells are not of sufficient quality, nor do the data include sufficient parameters, to prove or disprove conclusively the hypothesis that natural attenuation is occurring. Alternately, several additional extraction wells may be required to establish hydraulic control of the contaminated plume to meet EPA's cleanup objectives. To address these issues it will be necessary to acquire data to compensate for inadequacies in the construction of the existing wells (too large of a screen interval), and the need for some additional monitoring wells in alternate locations in the aquifer. Pilot testing of in situ remediation approaches also seems appropriate in light of the present difficulty of establishing hydraulic control consistent with the pre-design information.

X. Recommendations and Follow-up Actions

The current pump and treat system appears to have little or no effect on the ground water plume. The original extraction system design assumptions, and the system's performance over the past six years, should be evaluated to determine whether the installation of additional wells could establish hydraulic control of the contaminated plume. Other remedial approaches should also be considered. If it can be established that the ground water plume is stable and undergoing natural attenuation, then hydraulic control may not be necessary to prevent further migration of the plume. To achieve ROD remediation goals within the plume, an in situ remediation system may be feasible.

Before additional remediation alternatives are developed, the existing monitoring program should be improved so that the geochemical properties, and the lateral and vertical extent of the plume can be properly established and effectively monitored. This will require additional monitoring wells, additional monitoring parameters, and different sampling techniques.

XI. Protectiveness Statements

Immediate threats have been addressed through the provision of alternate water supply , removal of seven storage tanks, enclosure of the North Central Canal in a pipeline, and relocation of nearby residents.

The treatment plant for OU1 is effective in meeting regulatory requirements for the water treated at the facility. The OU2 remedy currently being constructed is expected to be protective upon completion with respect to eliminating threats posed by direct contact with the wastes.

The remedy for OU1, the Groundwater and Tanks Operable Unit, is protective over the near-term, however, the long-term protectiveness determination for OU1 cannot be made at this time until further information is obtained. Further information will be obtained by :

- revising sampling protocols to include appropriate additional data parameters and to ensure that the data meet appropriate data quality objectives;
- acquiring additional ground water monitoring data from existing wells;
- installing and monitoring additional ground water wells as necessary;
- conducting testing to determine the feasibility of addressing the sources of volatile organic compounds in ground water with nutrient enhanced bioremediation; and
- conducting testing to determine the feasibility of addressing chlorinated solvents in ground water by the addition of hydrogen-releasing or oxygen-releasing compounds to the subsurface.

It is expected that these actions will take approximately two and one-half years to complete, at which time a protectiveness determination will be made.

XII. Next Review

The next five-year review for the Purity Oil Sales site will be conducted within five years of the completion of this review, September 28, 2006.

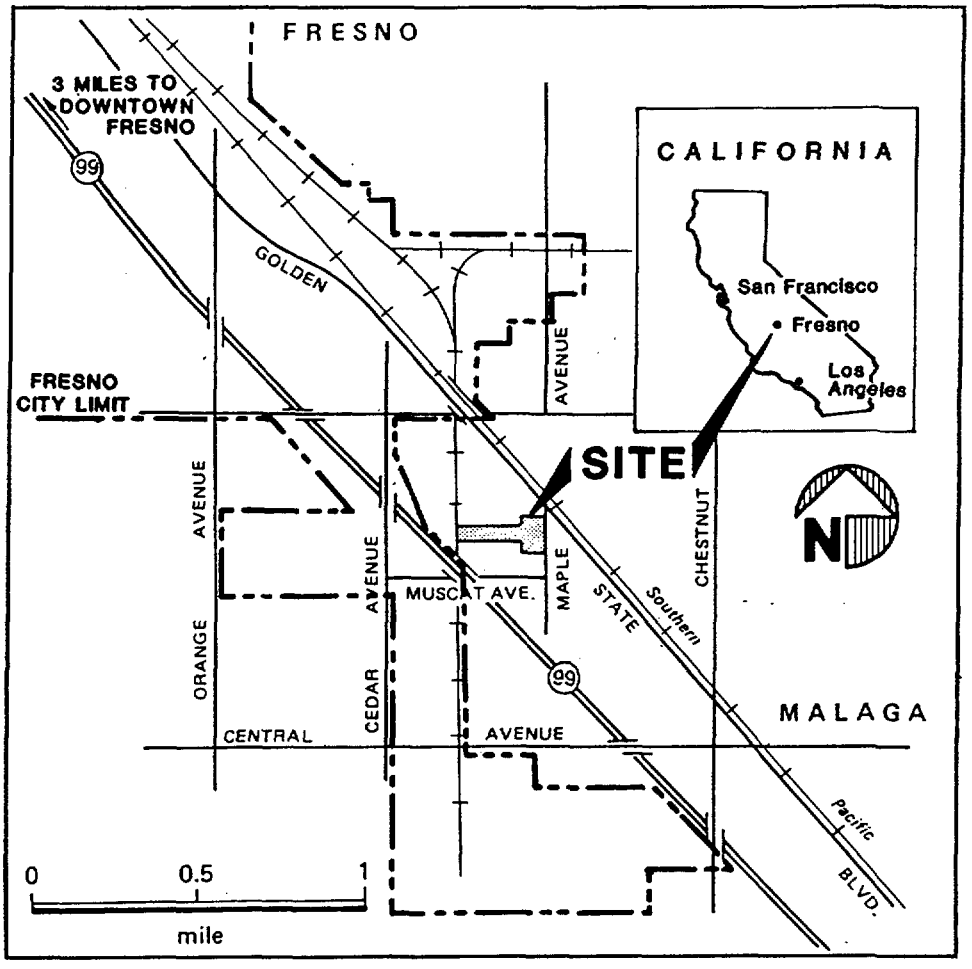

FIGURE 1

SITE LOCATION MAP

REMEDIAL INVESTIGATION REPORT
PURITY OIL SALES SITE
FRESNO, CALIFORNIA

RDD63320.RI

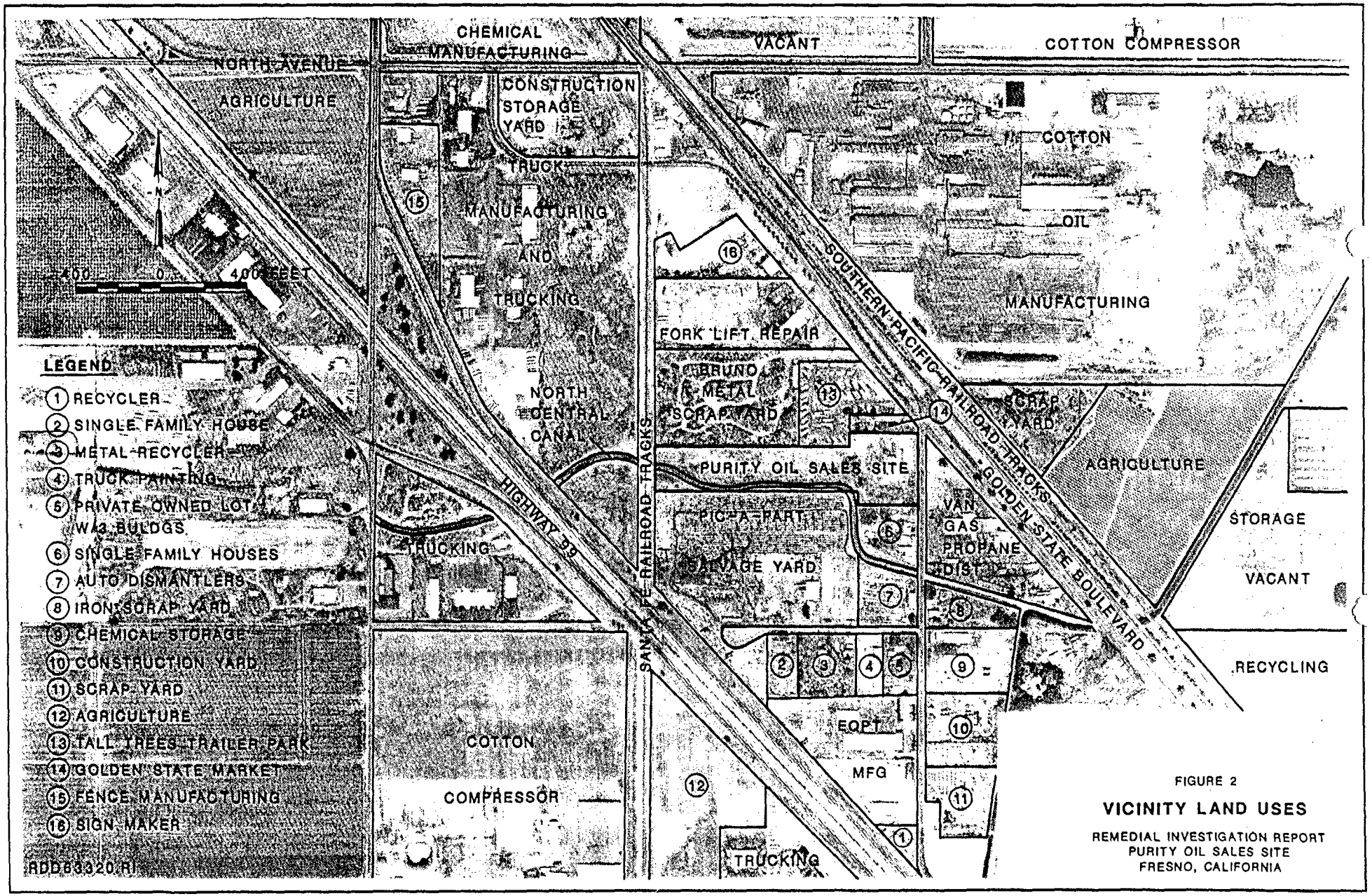

FIGURE 2

VICINITY LAND USES

REMEDIAL INVESTIGATION REPORT
PURITY OIL SALES SITE
FRESNO, CALIFORNIA

Attachment 1

List of Documents Reviewed

U.S. Environmental Protection Agency, Drinking Water Branch, 1989. " Region IX EPA Drinking Water Standards and Health Advisory Table." June.

U.S. Environmental Protection Agency, Region IX, 1989. " Record of Decision for the Purity Oil Sales Superfund Site, Groundwater and Tanks Operable Unit" September.

U.S. Environmental Protection Agency, Region IX, 1992. " Record of Decision for the Purity Oil Sales Superfund Site, Soils Operable Unit" September.

Environmental Solutions, 1993. "Final (100%) Design Report OU1 Groundwater Extraction and Treatment, Purity Oil Sales Site, Fresno County, California." June.

EnviroSolve, 1995. "Quarterly Groundwater Monitoring Report, First Quarter 1995, Purity Oil Sales Site, 3281 South Maple Avenue, Malaga, California." March.

U.S. Environmental Protection Agency, Region IX, 1996. " Explanation of Significant Differences for the Purity Oil Sales Superfund Site, Soils Operable Unit." July.

U.S. Environmental Protection Agency, Region IX, 2001. " Explanation of Significant Differences for the Purity Oil Sales Superfund Site, Soils Operable Unit." March.

Tetra Tech EMI, 2001. "Transmittal Letter, Digital Photographs - Excavation in Rear of Golden State Market." May.

IT Corporation, 2001. "Groundwater Monitoring Report, First/Second Quarter 2001, Purity Oil Sales Superfund Site, 3281 South Maple Avenue, Malaga, California." July.

ATTACHMENT 2

SITE INSPECTION CHECKLIST

PURITY OIL SALES

FRESNO COUNTY, CALIFORNIA

OSWER No 9355.7-03B-P

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION

Site name: Purity Oil Sales	**Date of inspection:** 9/24/01
Location and Region: Fresno, CA	**EPA ID:**
Agency, office, or company leading the five-year review: TtEMI	**Weather/temperature:** 60°F / partial cloudy

Remedy Includes: (Check all that apply)

- (Landfill cover/containment) under construction
- (Access controls)
- Institutional controls
- (Groundwater pump and treatment)
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Tom Meichtry (Name) Program Mgr (Title) _____ (Date)
   Interviewed at site at office (by phone) Phone no. 925-288-9898 (Concord office)
   Problems, suggestions; Report attached _____

2. **O&M staff** Mark Czipka (Name) O&M Technician (Title) 9/24/01 (Date)
   Interviewed (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached ✓ _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

	Name	Title	Date	Phone no.
Agency EPA Region 9				
Contact	Rosa Marie	RPM		415-744-2231
Problems; suggestions; Report attached				
Agency EPA, Region 9				
Contact	Rick Suggreh			
Problems; suggestions; Report attached				
Agency RWQCB - Central Valley Region				
Contact	Carlon Shrure			559-445-6189
Problems; suggestions; Report attached				
Agency				
Contact				
Problems; suggestions; Report attached				

4. **Other interviews (optional)** Report attached.

OSWER No. 9355.7-03B-P

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A

Remarks: Maintenance logs: by date on computer & hard copy

2	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A

Remarks: (not separate document part of H&S plan)

3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A

Remarks: On file in Concord office (all H&S); No official O&M training

4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge ✓ RWQCB Order	Readily available	Up to date	N/A
	Waste disposal, POTW ✓	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A

Remarks: RWQCB Order No. 5-00-008; Malaga County Water District #1094

5.	**Gas Generation Records**	Readily available	Up to date	N/A

Remarks:

6.	**Settlement Monument Records**	Readily available	Up to date	N/A

Remarks:

7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A

Remarks: Missing Jan, Feb, & Aug '99, Jan '00, & May '01 (at site)

8.	**Leachate Extraction Records**	Readily available	Up to date	N/A

Remarks:

9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A

Remarks: August '01 report - 1st report since re-startup; Oct '99 → Dec. '00 Estimated flow volumes, not totalizer

10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A

Remarks: Not maintained for GW treatment area; Maintained for construction site

IV. O&M COSTS

1. **O&M Organization**
   State in-house — Contractor for State
   PRP in-house — Contractor for PRP
   Federal Facility in-house — Contractor for Federal Facility
   Other _____

2. **O&M Cost Records** AM in Concord Office of IT
   Readily available — Up to date
   Funding mechanism/agreement in place
   Original O&M cost estimate _____ Breakdown attached

   Total annual cost by year for review period if available

   From _____ Date To _____ Date _____ Total cost — Breakdown attached
   From _____ Date To _____ Date _____ Total cost — Breakdown attached
   From _____ Date To _____ Date _____ Total cost — Breakdown attached
   From _____ Date To _____ Date _____ Total cost — Breakdown attached
   From _____ Date To _____ Date _____ Total cost — Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS — Applicable N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured — N/A
   Remarks Temporary fencing during construction phase
   6pm-6am Security guard on site

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A
   Remarks on gate & GW treatment system
   ~~Others~~ during construction
   taken down

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes / No / N/A
Site conditions imply ICs not being fully enforced — Yes / No / N/A

Type of monitoring (e g., self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)

Reporting is up-to-date — Yes / No / N/A
Reports are verified by the lead agency — Yes / No / N/A

Specific requirements in deed or decision documents have been met — Yes / No / N/A
Violations have been reported — Yes / No / N/A
Other problems or suggestions: Report attached

2. **Adequacy** — ICs are adequate / ICs are inadequate / N/A
Remarks _____

D. General

1. **Vandalism/trespassing** — Location shown on site map / No vandalism evident
Remarks Continuous problem from adjacent properties (Pick a Part). 2-3 fence cuts/month. Additional security in last year has helped.

2. **Land use changes on site** (N/A)
Remarks _____

3. **Land use changes off site** N/A
Remarks Closure of trailer park due to car construction. Volleyball court behind Golden State Market closed. New Pick a Part auto parts lot on adjacent property.

VI. GENERAL SITE CONDITIONS

A. Roads — Applicable / N/A — Dirt only during construction

1. **Roads damaged** — Location shown on site map / (Roads adequate) / N/A
Remarks Paved road only around treatment facility — blocked by trailers during construction.

B. Other Site Conditions

Remarks Under construction for cap.

VII. LANDFILL COVERS (Applicable) N/A Under construction

A. Landfill Surface

1. **Settlement (Low spots)** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5 **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6 **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**		Wet areas/water damage not evident	
	Wet areas		Location shown on site map	Areal extent_____
	Ponding		Location shown on site map	Areal extent_____
	Seeps		Location shown on site map	Areal extent_____
	Soft subgrade		Location shown on site map	Areal extent_____
	Remarks_____			
9.	**Slope Instability**	Slides	Location shown on site map	No evidence of slope instability
	Areal extent_____			
	Remarks_____			
B. Benches		Applicable	N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	**Flows Bypass Bench**		Location shown on site map	N/A or okay
	Remarks_____			
2.	**Bench Breached**		Location shown on site map	N/A or okay
	Remarks_____			
3.	**Bench Overtopped**		Location shown on site map	N/A or okay
	Remarks_____			
C. Letdown Channels		Applicable	N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	**Settlement**		Location shown on site map	No evidence of settlement
	Areal extent_____		Depth_____	
	Remarks_____			
2.	**Material Degradation**		Location shown on site map	No evidence of degradation
	Material type_____		Areal extent_____	
	Remarks_____			
3.	**Erosion**		Location shown on site map	No evidence of erosion
	Areal extent_____		Depth_____	
	Remarks_____			

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** N/A Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes** Yes
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill) Yes
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A
1. **Gas Treatment Facilities** Flaring Thermal destruction Collection for reuse Good condition Needs Maintenance Remarks_____		
2. **Gas Collection Wells, Manifolds and Piping** Good condition Needs Maintenance Remarks_____		
3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings) Good condition Needs Maintenance N/A Remarks_____		
F. Cover Drainage Layer	**Applicable**	**N/A**
1. **Outlet Pipes Inspected** Functioning N/A Remarks_____		
2. **Outlet Rock Inspected** Functioning N/A Remarks_____		
G. Detention/Sedimentation Ponds	**Applicable**	**N/A**
1. **Siltation** Areal extent_____ Depth_____ N/A Siltation not evident Remarks_____		
2. **Erosion** Areal extent_____ Depth_____ Erosion not evident Remarks_____		
3. **Outlet Works** Functioning N/A Remarks_____		
4. **Dam** Functioning N/A Remarks_____		

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differennal_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	(Applicable)	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating (Needs Maintenance) N/A
   Remarks Area under construction.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition (Needs Maintenance)
   Remarks Area under construction.

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks Adequate supply must parts.

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

OSWER No. 9355.7-03B-P

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - (Metals removal) Oil/water separation Bioremediation
   - (Air stripping) Carbon adsorbers
   - (Filters) Greensand
   - Additive (e.g., chelation agent, flocculent) KMnO4
   - Others
   - Good condition (Needs Maintenance)
   - Sampling ports properly marked and (functional) Not marked
   - Sampling/maintenance log displayed and up to date No.
   - Equipment properly identified
   - Quantity of groundwater treated annually 1.57 Million Gallons (last year)
   - Quantity of surface water treated annually
   - Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A (Good condition) Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   N/A (Good condition) Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   N/A (Good condition) Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   N/A (Good condition) (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored ✓
   Remarks Acids kept separate from KMnO4

6. **Monitoring Wells** (pump and treatment remedy) quarterly
   Properly secured/locked Functioning (Routinely sampled) Good condition
   All required wells located Needs Maintenance N/A
   Remarks All MW extended during construction. Some wells lost over past several years due to construction.

D. Monitoring Data

1 Monitoring Data
   (Is routinely submitted on time) Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

ATTACHMENT 3

REVIEW OF PLANT PERFORMANCE AND OPERATIONS DATA

PURITY OIL SALES

FRESNO COUNTY, CALIFORNIA

Prepared for

United States
Environmental Protection Agency
Remedial Project Manager

FIVE-YEAR PERFORMANCE REVIEW OF GROUNDWATER EXTRACTION AND TREATMENT PLANT PURITY OIL SALES SITE FRESNO COUNTY, CALIFORNIA

September 27, 2001

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LIST OF TABLES

1.0 INTRODUCTION

The Purity Oil Sales property in Fresno County, California is the location of a former oil recycling facility, which operated from 1934 to 1973. The easternmost portion of the site included storage and processing facilities for the refining and recycling operations. The western portion of the site consisted of unlined sumps and sludge pits used for the collection and storage of oil and by-products from the refining processes. In 1983, the site was included on the National Priority List (NPL) based on soil, groundwater, and air quality investigations conducted by the Environmental Protection Agency (EPA), Department of Health Services (DHS), and the California Regional Water Quality Control Board – Central Valley Region (RWQCB).

From 1984 to 1988, EPA conducted multi-media field investigations of contamination at the site. EPA prepared a feasibility study (FS) for the Purity site in 1988. In 1989, EPA signed a record of decision (ROD) that presented the proposed remedy for groundwater and tanks, designated operable unit 1 (OU-1) (EPA 1989). The groundwater remedy involved installation of a groundwater extraction and treatment system, as specified in the document titled, "Final (100%) Design Report, OU-1 Ground Water Extraction and Treatment, Purity Oil Sales Site, Fresno County, California," dated June 22, 1993 (ESI, 1993).

As part of the OU-1 remedy, EPA is currently conducting a five-year review. The objective of this review is to verify that the groundwater treatment system is meeting the objective of the OU-1 remedy to treat extracted groundwater to acceptable discharge levels.

2.0 TREATMENT SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

The groundwater extraction and treatment system was designed for a nominal capacity of 300 gallons per minute (gpm), with a minimum operating capacity of 75 gpm and a maximum of 375 gpm.

Major components of the system were to include the following:

- Five extraction wells (two of which were regarded as contingency wells)
- A buried, double-containment pipe system to transmit pumped water to the treatment system,
- An influent storage tank (20,000 gallons)
- An iron and manganese treatment unit consisting of a potassium permanganate chemical feed system and a set of three greensand filtration tanks
- An air stripper surge feed tank (20,000 gallons)
- A VOC treatment unit consisting of an air stripping tower
- An effluent storage tank (20,000 gallons) to store treated water
- A backwash system to clean the greensand beds
- A treated water disposal system with discharge pipelines to the Fresno Irrigation District (FID)

2.1 GROUNDWATER EXTRACTION SYSTEM

The system design specified the installation of five extraction wells, each with capacities of 30 gpmto 75 gpm. Wells were to be placed, screened, and pumped to extract a sufficient quantity of water to capture and remove volatile organic compound (VOC)-affected groundwater in the upper aquifer. Average concentrations of VOCs, iron (Fe), and manganese (Mn) from quarterly groundwater sampling events were used to design the extraction well flows and concentrations.

2.2 CONSTITUENT REMOVAL REQUIREMENTS

Design criteria for the treatment plant were based on groundwater cleanup goals established in the record of decision (ROD), hydrogeologic conditions and VOC distributions determined from past investigations, and the appropriate regulatory and agency effluent discharge standards.

The ROD specifies that cleanup goals for both the aquifers at the site and the effluent standards for treated groundwater are the federal or state maximum contaminant levels (MCLs) and state action levels (SALs).

Table 1 shows a summary of the ROD cleanup goals for groundwater.

Table 1 - Record of Decision Groundwater Cleanup Goals

Compound	Cleanup Goals (ppb)
Inorganics	
Iron (dissolved)	300
Manganese (dissolved)	50
Volatile Organic Compounds	
Trichloroethylene	5
1,2-Dichloroethane	0.5
1,1-Dichloroethane	5
1,1-Dichloroethene	6
Benzene	1
Vinyl chloride	0.5
Carbon tetrachloride	0.5
cis-1,2-Dichloroethene	6
trans-1,2-Dichloroethene	10

The effluent discharge standards are included in NDPES permit, Malaga County Water District (MCWD) permit, and Fresno Irrigation District (FID) requirements. Table 2 lists the NDPES discharge requirements for the treatment plant.

Table 2 - NDPES Discharge Requirements

Compound	Discharge Standards (ppb)
Inorganics	
Iron (dissolved)	300
Manganese (dissolved)	50
Volatile Organic Compounds	
Trichloroethylene	5
1,2-Dichloroethane	0.5
1,1-Dichloroethane	5
1,1-Dichloroethene	6
Benzene	1
Vinyl chloride	0.5
Carbon tetrachloride	0.5
cis-1,2-Dichloroethene	6
trans-1,2-Dichloroethene	10

2.3 METALS TREATMENT SYSTEM

The metals treatment design consists of three pressurized greensand filtration beds operating in parallel following a potassium permanganate oxidizer solution feed system. As the oxidized water passes through the greensand system, the oxides of the soluble manganese and iron precipitate out of solution and are collected in the filter beds. The bed filter medium consists of a 20-inch deep layer of anthracite, a 20-inch deep layer of greensand, and a 12-inch bed of gravel. Each filter has a capacity of 188 gpm, half of the maximum total system capacity. To accommodate lower flows, potentially only one or two filters can be operated. Beds can be effectively operated at flows as low as ¼ of capacity (47 gpm). Backwash of each filter to remove deposited oxides of iron and manganese requires 400 gpm of backwater flow for ten minutes every 24 hours. When one filter is backwashing, the other two filters handle the flow of the system. Backwash water with precipitated metals is discharged to the MCWD sewer line.

2.4 VOC TREATMENT SYSTEM

The VOC treatment system consists of a countercurrent air-stripping column with random dump tri-pack packing materials. As the extracted water flows down through the column, dissolved VOCs in the water are transferred to the vapor phase in the rising air stream and are emitted from the top of the column. No treatment of the air emissions is required as the VOC concentrations in the water are relatively low and those in the air emissions are well below the regional emission standards. The column is to be operated on a continuous basis and has a nominal operating range of 300 gpm with a minimum flow of 75 gpm and a maximum flow of 375 gpm. To accommodate lower flows, the spray nozzles can be replaced with lower flow rate nozzles.

Treated water is stored in the effluent storage tank. Water from this tank is periodically used to perform backwashing on the greensand filter beds. Treated water from the treatment system is discharged to FID irrigation canals at two locations, depending on canal operations and maintenance requirements. The first discharge point is to the North Central Canal on the south side of the property. The second discharge point is at the junction of the North Central and Central Canals to the east side of the property

3.0 AS-BUILTS & OPERATIONS

The treatment plant was constructed by the Morrison Knudsen Corporation (MK) from 1993 to 1994. MK awarded the plant startup and operations contract to Krazen & Associates, Inc (Krazen). Krazen began plant startup activities in August 1994 and full operations commenced on December 28, 1994. The IT Corporation took over operations during the fall of 1998.

3.1 CURRENT CONDITIONS

The following list is a summary of changes to the design. Each item is discussed in more detail in sections 3.2.2 and 3.2.3:

- After the plant was constructed, the primary responsible parties (PRPs) reevaluated the design and presented a justification to reduce the number of groundwater extraction wells from five to two.
- Only one extraction well is currently in operation.
- Malfunctioning totalizers and associated flow elements were replaced in February 2001
- The treatment system is currently operated in a semi-batch mode due to the low flow rates
- The system is also operated semi-manually as the control system is designed for continuous flow.

3.2 OPERATIONS

Operation of the extraction and treatment system was modified to run as a batch treatment process because flows were too low to operate the plant continuously. Discharge of treated water to the FID is performed daily and discharge of backwash water to the MCWD sewer system is performed weekly. Table 3 of summarizes the available plant operational information as reported in monthly progress reports by Krazen.

IT Corporation took over operations of the plant during the fall of 1998. They continued to operate the plant in the same fashion as Krazen from that time to the present. A summary of IT's operations as reported in monthly progress reports is provided in Table 4.

Other information available but not reviewed that would provide further description of the operations is available with the RWQCB. The RWQCB has received monthly and annual reports from the operators.

3.2.1 System Shutdowns

The groundwater extraction and treatment system has been shut down on numerous occasions. Extraction well EW-1 failed in September 2000 when buried cables were damaged by construction machinery. Both extraction wells and the treatment system were shut off in January 2001 as the OU-2 cap was being completed and the wells were being repaired and extended. The system was restarted in July 2001. Other causes of plant shutdown and discharge irregularities have included freezing weather, pump failure, power loss, computer failure, and control system failure. Tables 3 and 4 summarize operations and system problems as reported by the operators.

3.2.2 Flow and Chemistry Data

In response to data anomalies in reported flows, an audit performed by IT in February 2001 (IT 2001) verified that there was an operational problem with the influent flow meter. The problem was twofold. First, the influent flow sensor (a paddlewheel) had been impacted with particulate matter (presumably metal precipitates) and was not operating reliably. Second, the flows were frequently below the lower end of the operating range of the flow meter (4 gpm). Despite the failure, the flow meter was neither replaced nor repaired immediately. The operator instead had been estimating daily flows by measuring the change in fluid levels in the influent storage tank and reported this estimate as the reading from the totalizer. The influent flow sensor and associated instruments were replaced on February 12, 2001. Additionally, a totalizing flow meter was installed on both the effluent (following P-104) and filter backwash (following P-106) to measure flows at these points. Effluent flows reported since the system was restarted in July 2001 are based on the effluent flow meter readings.

Samples of the influent groundwater from the extraction wells have not been taken on a routine basis since early 1999. However, the extraction wells have been sampled as part of the quarterly groundwater monitoring effort. Results from EW-2 have reached non-detection levels and are no longer sampled.

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Aug-93	MK	* Completed analysis of Sixth Respondent Quarterly Sampling activities and the Final Remedial Action Work Plan was submitted on August 10, 1993	* None	* None
Sep-93	MK	* Conducted the Seventh Respondent Quarterly Sampling Analysis activity		
	MK	* Completed the selection process for an OU-1 construction manager (MK)		
Oct-93	MK	* Conducted Remedial Action kick off meeting	* None	* None
Nov-93	MK	* Conducted site visit on 11/16/93 and issued request for quotation for all major equipment		
Dec-93	MK	* Received all contract bids		
	MK	*Completed quarterly groundwater sampling for Dec		
Jan-94	MK	* Major equipment procurement complete and all contracts issued and signed and construction management team mobilization complete	* Late deliveries of major equipment items	
Feb-94	MK	* EW-1 and EW-2 drililng phase completed	* Late deliveries of major equipment items	
	MK	* Treatment plant found 40% complete	* Discovery of lead and PCB in planned areas of construction	
	MK	* Install portable water line to property complete		
	MK	* Major equipment vendor drawings review complete		
	MK	* Mobilization of construction subcontractor complete		
	MK	* Property survey complete		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Mar-94	MK	* Complete treatment plant foundation (face slab)	* Potential late delivery of greensand filters	* Incorporating methods of accelerate piping work
	MK	* Completed offsite sewer and treated water discharge line installed		
	MK	* Completed outfall construction (canal discharge points)		
	MK	* ESI completed quarterly GW sampling		
Apr-94	MK	* Complete all major concrete installation	* None	* None
	MK	* Completed treatment plant connections to offsite treated water discharge and sewer lines		
	MK	* Completed installation of pipe rack (construction steel)		
	MK	* Fabricating piping for treatment facility (partial installation)		
	MK	* Setting system pumps (grouting pump base plates)		
May-94	MK	* Received, assembled and set all major equipment items	* Potential delay in project completion due to additional electrical work	
	MK	* Fabricating and installing interconnectivity piping		
	MK	* Installed motor control center		
	MK	* Finished installation of double wall piping for EW		
	MK	* Installing electrical conduit throughout system		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Jun-94	MK	* Completed all piping fabrication and installation work	* None	* None
	MK	* Completed well head concrete containment pads		
	MK	* Completed installation of greensand filter media		
	MK	* ESI completed quarterly GW sampling		
	MK	* Issued bid packages for O&M contractor		
	MK	* Completed all electrical conduit installation		
Jul-94	MK	* Completed installation of facility control system	* None	* None
	MK	* Complete review of O&M contract proposals		
	MK	* Complete EPA Pre-Final Inspection and Test		
	MK	* Issued EPA Pre-Final Test Report		
Aug-94	KRAZAN	* Analysis did not meet discharge criteria for iron and manganese	* Greensand filters not completely removing iron and manganese from the well water	* Worked to re-condition the greensand filters and rectified the problem
	MK	* Awarded O&M contract to Krazan & Associates, Inc.	* None	* None
	MK	* Completed O&M operator training		
	MK	* Completed EPA Final Inspection and Report		
	MK	* Demobilized all subcontractors equipment		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Oct-94	KRAZAN	* Trouble shooting of greensand filters	* Conditioning of greensand filters	* Initiated reconditioning of greensand filters
	KRAZAN	* Trouble shooting of the filter skid valves		
	KRAZAN	* FID license agreement has been signed		
	KRAZAN	* Completed commissioning and trouble shooting of treatment system	* Negotiations of discharge agreement with FID	* Continue negotiation with FID
	KRAZAN	* Submitted influent and effluent samples for analysis	* Control of chemical dosing plant feed rate	* The dosing pump controls and pump's associated piping were checked. The pump is now functioning with design parameter.
Nov-94	KRAZAN	* Finished backwashing and reconditioning Filter#1	* Removal of manganese at the greensand filters	* Thoroughly rise of greensand filters
	KRAZAN	* Rinsed Filter #1 thoroughly		
	KRAZAN	* Trouble shooting extraction well #1 power supply. Problem fixed.		
	KRAZAN	* Input new back wash program into greensand filter controller		
Dec-94	KRAZAN	* Backwashing and reconditioning Filter #2 and #3	* Chemical closing pump feed rate for continuous regeneration of greensand filters	* Close monitoring of greensand filter via sampling
	KRAZAN	* Took samples on all three filters and effluent from air stripper column system operational		
	KRAZAN	* Started full operation of treatment plant on Dec 28, 1994		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Jan-95	KRAZAN	* Operate groundwater treatment system	* Chemical closing pump feed rate for continuous regeneration of greensand filters	* Close monitoring of greensand filter via sampling
	KRAZAN	* Sampled effluent and receiving water weekly per NPDES permit		
	KRAZAN	* Started aquifer pump test and data collection		
	KRAZAN	* Completed quarterly groundwater sampling		
Feb-95	MK	* Operate groundwater treatment system	* Chemical dosing pump feed rate for continuous regeneration of greensand filters	* Install valve in chemical dosing line to stop siphoning effect; researching for valve compatible with KMnO4
		* Sampled effluent and receiving water per NPDES permit		* Close monitoring of greensand filter via sampling
		* Finished aquifer pump test and data collection		
		* Drained and treated water baker Tank No. 7203		
		* Drained and treated water baker Tank No. 7056		
		* Pump drilling mud for baker tank No. 7056 on-site		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Mar-95	KRAZAN	* Operate groundwater treatment system	* Chemical closing pump feed rate for continuous regeneration of greensand filters	* Modify periodic maintenance to include inspection of flow control valve FCV006
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Operated chemical wash system on air stripper tower		
Apr-95	KRAZAN	* Operate groundwater treatment system	* Software graphics controls	* Working with Tesco Controls, Inc. to install software update
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Performed operations to investigate low well flows		
May-95	KRAZAN	* Operate groundwater treatment system	* Erractic flow transmitter readings at the extraction well	* Update maintenance schedule to include a weekly cleaning flow transmitter paddle wheels
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Installed software update from Tesco Control, Inc.		
Jun-95	KRAZAN	* Operate groundwater treatment system	* Site security	* Post "no trespassing" signs on fence by trailer park and FID North Central Canal (signs are bi-lingual)
		* Sampled effluent and receiving water weekly per NPDES permit		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Jul-95	KRAZAN	* Operate groundwater treatment system	* Initital start up of automatic operation of water treatment plant	* Close monitoring of facility using a remote computer via modem
		* Sampled effluent and receiving water weekly per NPDES permit		* Install and setup an autodialer to notify standby personnel of alarm conditions
Aug-95	KRAZAN	* Operate groundwater treatment system	* Restricted flow at EW-1 due to organic buildup in 1.5 inch piping at wellhead which is reducing the pipe diameter	* Disassemble and flush organic buildup from piping
		* Sampled effluent and receiving water weekly per NPDES permit		
	MK	* Operate groundwater treatment system	* Restricted flow at EW-1 due to organic buildup in 1.5 inch piping at wellhead which is reducing the pipe diameter	* Disassemble and flush organic buildup from piping
Sep-95	KRAZAN	* Operate groundwater treatment system	* Flow sensors on filters F-101A and B inoperative, therefore equal flow through filters cannot be verified	* Replace faulty flow sensors
		* Sampled effluent and receiving water weekly per NPDES permit		
Sep-95	MK	* Operate groundwater treatment system	* Flow sensors on filters F101A and B inoperation, therefore equal flow through filters cannot be verified	* Replace faulty flow sensor

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
		* Sampled effluent and receiving water weekly per NPDES permit		
Oct-95	KRAZAN	* Operate groundwater treatment system	*LPU failure and consequent extended plant shutdown	* Replace failed LPU and program system alarms to notify site manager of failures in the future, thus shorten plant downtime
		* Sampled effluent and receiving water weekly per NPDES permit		
Nov-95	MK	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Split effluent sample with RWQCB to verify analyses		
Dec-95	KRAZAN	* Operate groundwater treatment system	* Sump pumps not starting before setting of hi-hi alarm and shutting down all system	* Check pump seals and test system for leaks
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Split effluent sample with RWQCB to verify analyses		
Jan-96	KRAZAN	* Operate groundwater treatment system	* Sump pumps not starting before setting of hi-hi alarm and shutting down all system	* Collect information on sump pump limit switches and recalibrate the limit switches
		* Sampled effluent and receiving water weekly per NPDES permit		
Feb-96	KRAZAN	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Mar-96	KRAZAN	* Operate groundwater treatment system	* Erratic flow reading from EW-1	* Troubleshoot and replace flow transmitter if necessary
		* Sampled effluent and receiving water weekly per NPDES permit	* Pump shutdown at EW-1	* Troubleshoot shutdown at EW-1
Apr-96	KRAZAN	* Operate groundwater treatment system	* Overflow of 30% KMnO4 solution at T-102	* Repair portable water inlet valve to T-102
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Repaired pump at EW-1		
May-96	KRAZAN	* Operate groundwater treatment system	* Loss of control of automated valve due to valve shim fractures	* Inspect valve shims and replace worn or broken shims
		* Sampled effluent and receiving water weekly per NPDES permit		
Jun-96	KRAZAN	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		

Table 3

Operational History Reported by Morrison-Knudsen and Krazen Groundwater Extraction and Treatment Plant Purity Oil Sales Site, Fresno, California

Date	Who	Event	Potential Problem	Action to Rectify Problems
Jul-96	KRAZAN	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		
Aug-96	KRAZAN	* Operate groundwater treatment system	* Erratic flow transmitter at EW-1	* Troubleshoot transmitter and replace if necessary
		* Sampled effluent and receiving water weekly per NPDES permit		
Mar 96 till Apr 97	KRAZAN	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		
May 97 till Aug	MK	* Operate groundwater treatment system	* None	* None
		* Sampled effluent and receiving water weekly per NPDES permit		
Sep-97	MK	* Operate groundwater treatment system	* Loss of water pressure at EW-1	* Replace submersible pump at EW-1
		* Sampled effluent and receiving water weekly per NPDES permit		
		* Replaced submersible pump at EW-1		
Oct 97 till July 98	KRAZAN	* Operate groundwater treatment system		
		* Sampled effluent and receiving water weekly per NPDES permit		

NOTES:

1. KRAZAN Progress Report

Final 100% Remedial Design Report approved by the EPA on June 29, 1993 and Remedial Design is completed

2. Morrison Knudsen Corp (MK) Progress Report

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
^ Dec 98	* Water pipes and valves damaged due to below freezing temperatures	197,615	* No discharge on 12/19 due to purge water from QM&S event disrupted system timing
	* System shutdown for repairs and restarted on Dec 31		* No discharge on 12/23-31 due to system shutdown because of extremely cold temperatures
	* Receiving water sample not collected because no flow occurred in the canal		* No treated GW was discharged to the FID central canal no.23 discharge location D-2.
^ Jan 99	* During Dec 98 monitoring event, MW-23 and MW-24 (on the former Waste Management of Fresno Country property) was damaged by a tenant	194,340	* No discharge on 1/2-3 due to reduced extraction because of EW-1 electrical failure
	* MW-24 was found to be irreparable		* No discharge on 1/7-13 due to system shutdown because of frozen line on P-101 pump
	* Receiving water sample not collected because no flow occurred in the canal		* No treated GW was discharged to the FID central canal no.23 discharge location D-2
^ Feb 99	* MW-24 was found to be irreparable	202,810	* No discharge on 2/12 due to EW-2 valve failure
	* Work plan submitted to USEPA on Feb 22, 99.		* No treated GW was discharged to the FID central canal no.23 discharge location D-2
	* On Feb 12 system was shut to repair a valve in the conveyance piping from EW-2 to the treatment system		
^ Mar 99	* During Dec 98 monitoring event, MW-23 and MW-24 (on the former Waste Management of Fresno Country property) was damaged by a tenant	212,459	* No discharges on 3/24 due to two discharges on 3/25
	* MW-24 was found to be irreparable		* No discharge to FID central canal no.23 location D-2

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
^ April 99	* Receiving water samples collected at upstream location R1 and downstream location R3	195,258	
^ May 99	* MW-24 still remains unusable	160,527	* No discharge on 5/2 due to two discharges
	* Work plan for destruction and replacement of MW-24 is with USEPA for review and approval		* No discharges on 5/26 due to failure of pump in EW-2
	* EW-2 out of service on May 26 until early June due to failure of downhole pump (repair have been completed and well returned to service as of this date).		* No discharges on 5/30 due to failure of recirculation valve in EW-1
	* Receiving water samples collected at upstream (R1) and downstream (R3)		
^ June 99	* Supplemental work to measure dissolved oxygen in wells; sampled water in extraction wells; sampled water in MW-19	142,428	* No discharge on 6/6 due to two discharges on 6/10
	* EW-2 was returned to service early in the month (approximately one week of nonoperation caused by failure of the downhole pump)		* No discharges on 6/16 due to staffing for quarterly GW sampling event
	* Receiving water samples collected at upstream (R1) and downstream (R3)		* No discharge on 6/23 due to two discharges on 6/24
^ July 99	* Supplemental work to measure dissolved oxygen in each well, as feasible; sampled water in extraction wells; sampled water in MW-19		
	* Power supply for site computer failed causing loss of data for July 25 and 26 (Extraction and discharge data was estimated)		

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
^ Aug 99	* Receiving water samples collected at upstream (R1) and downstream (R3)	175,441	* Estimated discharges on 7/25-26 due to computer power supply failure
^ Sept 99	* MW-24 remains unusable	158,920	
	* Work plan for MW-24 destruction and replacement under review since June 99		
	* MW-18 unearthed by Bruno's Scrapyard; IT is assessing its conditions.		
	* Receiving water samples collected at upstream (R1) and downstream (R3)		
Oct 99	* Valve failure at EW-2 on 10/24		
	* IT determined MW-18 (buried years at Bruno's Scrapyard) is too shallow to sample groundwater		
^ Nov 99	* MW-24 remains unusable	164,303	
	* IT determined MW-18 (buried years at Bruno's Scrapyard) is too shallow to sample groundwater		
	* Receiving water samples (R1 and R3) not collected due to dry canal		
^ Dec 99	* Receiving water samples (R1 and R3) not collected due to dry canal	135,065	* No discharge on 12/18-19 due to failure of EW-1 pump motor
^ Feb 00	* Receiving water samples (R1 and R3) not collected due to dry canal	161,994	* No discharge on 1/15 due to fouled EW-1
			* No discharge on 1/30 due to rain water collected in sumps affecting the system timing
^ Mar 00	* Receiving water samples collected at upstream (R1) and downstream (R3)	169,425	* No discharge on 3/12 due to computer error

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
^ April 00	* Additional sampling to evaluate the extent, rates and mechanisms of biodegradation of dissolved chlorinated compounds	144,336	* No discharges on 4/3-4 due to control-system failure
	* Receiving water samples collected at upstream (R1) and downstream (R3)		* No discharge on 4/18 due to power failure
^ May 00	* Receiving water samples collected at upstream (R1) and downstream (R3)	164,354	
June 00	* Receiving water samples collected at upstream (R1) and downstream (R3)	162,907	* On 6/11 data was lost due to computer failure (gallon total 5264 was estimated based on PLC setpoints)
Aug 00	* Receiving water samples collected at upstream (R1) and downstream (R3)	122,956	* No discharge on 8/17 due to reduced EW-1 extraction rate
			* No discharge on 8/20 due to P-104 pump failure
			* No discharge on 8/22-27 due to power loss
^ Sept 00	* EW-1 pump failed on Sept 13, and was not repaired before end of the month	108,421	* No discharge due to reduced EW-1 extraction rate
	* Receiving water samples collected at upstream (R1) and downstream (R3)		* P104 pump failure and power loss
^ Nov 00		67,067	* No discharges on Nov 2 due to changes made in the system timing
			* Flow directed to Fresno Irrigation District north central canal No.26, discharge location D-1
^ Dec 00	* EW-1 shut awaiting repairs	69,923	* Flow directed to Fresno Irrigation District north central canal No.26, discharge location D-1

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
^ Dec 00	* Flow totalizer out of order for at least 2 years. Discharge volumes and projected totalizer readings was institutionalized as a field practice at the time the totalizer failed. "Flow Totalizer Readings" was a series of calculated values based on the daily discharge. Volume of the water treated is calculated from the daily high-level and low-level of the holding tank. The totalizer is being repaired and an audit will be conducted of the volumes reported since the totalizer was out-of-service		
Jan 01	* System extracted water but did not discharge	None in January	
	* EW-1 continued to be shut in awaiting repairs and vertical extension		
	* EW-2 shut for routine maintenance and vertical extension		
	* System did not discharge and no effluent was sampled. The flow totalizer is being "repaired" and an audit is being conducted of the volumes reported since the totalizer was out of service. The Flow Element FE-009 will be replaced with a Signet Model 515 Rotor-X paddlewheel flow sensor. The Flow Transmitter FT-009 will be replaced with a Signet Model number 8550-1 flow transmitter/totalizer. FE-010 at P-106 will be replaced with a Signet Model 515 Rotor-X paddlewheel flow sensor. FT-010 will be replaced with a Signet Model number 8550-1 flow transmitter/totalizer.		

Table 4

Operational History Reported by IT Corporation
Groundwater Extraction and Treatment Plant
Purity Oil Sales Site, Fresno, California

Date	Event	Discharge (gallons)	Notes for Discharge
Mar 01	* Delayed due to Stop Work letter	None in March	
	* EW-1 shut awaiting repairs and vertical extension		
	* EW-2 shut off on Jan 2, 2001 for routine maintenance and vertical extension		
	* System was shut off awaiting completion of the cap system		
	* No samples were collected in March 2001		
May and June 01	* GW monitoring program between May 7 through 15, 2001	None in May	
	* EW-1 shut awaiting repairs and vertical extension		
	* EW-2 shut off on Jan 2, 2001 for routine maintenance and vertical extension		
	* System was shut off awaiting completion of the cap system		
	* No samples were collected in March 2001		

NOTES:

No chemical analytes were present in excess for the months presented

^ Effluent sample was taken at the treatment plant at Pump P105.

* Effluent includes iron, manganese, TCE, 1,1-DCA, 1,2-DCA, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, benzene, chlorobenzene, 1,2-dichlorobenzene, vinyl chloride, other VOCs, and pH

3.2.3 Field Trip Observations

On Monday, September 23, 2001, Dr. Greg Swanson, P.E., of Tetra Tech EM Inc. inspected the plant and reviewed the operational records.

Key findings of Dr. Swanson's visit were the following:

- The groundwater extraction wells were originally designed with the expectation of obtaining a 60 gpm flow per well from 5 wells. However, only two wells were ultimately installed (EW-1 and EW-2) and these wells have never achieved flows more than about 10 gpm combined on a monthly average basis.
- The only operating well at this time (EW-1) is currently producing approximately 2.5 gpm. EW-2 is out of service due to construction activities associated with the cap. In the past few months, when both EW-1 and EW-2 were operating, flow from the wells was about 4 gpm.
- The current mode of operation is semi-batch, wherein the influent flow from the extraction wells is collected in the influent tank for 24 hours, then passed through the treatment system at approximately 200 gpm. Thus, the treatment system is operating for less than ½ hour per day under current conditions. The filters are backwashed only once per week under the current operating conditions, rather than the 4 times per day originally expected for operation of the treatment system at capacity.
- The treatment system is operated semi-manually for the short operational period each day because the computerized control system is oriented toward continuous operation and some control elements (e.g., automated valves) are not functioning.
- All physical treatment unit operations, including the permanganate injection system, the filters, and the air stripper, are in good condition and capable of operating at design capacity. The acid addition subsystem associated with the air stripper cleaning requires equipment replacement to function effectively, but is not required at the low flows currently being processed.
- The control computer incorporates outdated hardware and software, and is adequate only for the current semi-batch operating mode. The software system is not Y2K compliant and is not actively supported any longer by the software vendor. Any failure in the hardware or software would likely require system replacement due to the lack of availability of parts and service.
- Over the past 5 years, the treatment system has consistently produced an effluent in which the concentrations of contaminants of concern (chlorinated hydrocarbons, manganese, iron) are below the cleanup goals. However, influent concentrations of these contaminants have not been monitored since early 1999 and it is suspected that influent concentrations of most chlorinated hydrocarbon contaminants may already be below cleanup goals before treatment.

Additional information from Dr. Swanson's audit is provided in the attached 5-year review checklist.

4.0 RECOMMENDATIONS

The following is a list of recommendations based on this five-year review of the groundwater and extraction treatment system.

- The software system associated with the plant controls should be updated to be Y2K compliant and to resume active support from the vendor.

REFERENCES:

U.S. Environmental Protection Agency (EPA). 1989. "Record of Decision for the Purity Oil Sales, Inc. Superfund Site, Groundwater and Tanks Operable Unit." September 26.

Environmental Solutions, Inc. (ESI). 1993. "Final (100%) Design Report, OU-1 Ground Water Extraction and Treatment, Purity Oil Sales Site, Fresno County, California." June 22.

IT Corporation (IT). 2001. Letter Regarding the Resolution of Data Anomalies in the 12/2000 Monthly Effluent Monitoring Report at the Purity Oil Sales Superfund Site. From Thomas Meichtry, Program Manager. To Carlon Schrieve, California Regional Water Quality Control Board, Central Valley Region. February 22.